BUILDING ENERGY SIMULATION USER NEWS

Volume 20 ¨ Number 2 ¨ Summer 1999

For Users of DOE-2, SPARK, BLAST and their Derivatives

DOE-2.2 Announcement

Since 1993, Lawrence Berkeley National Laboratory, James J. Hirsch and Associates, and others have been developing a new version of the DOE-2 building energy simulation program—DOE-2.2. This new version was intended to replace the previous version, DOE-2.1E. DOE, EPRI, and others have been funding the development efforts.

Despite several years of intense negotiations, we have been unsuccessful in reaching a cross-license agreement with James J. Hirsch and Associates. Therefore, DOE has decided not to issue an "official, government sanctioned version" of DOE-2.2. Accordingly, no entity will have the right to claim that their product is an official version of DOE-2.2, or was derived from any official version of DOE-2.2. Private sector entities are prohibited from using the DOE acronym on any unofficial version of DOE-2.2 or any other product that utilizes or incorporates source code from DOE-2.2 or portions thereof where it is believed that such use could result in likelihood of confusion by the public. LBNL will continue to maintain and provide bug fixes for DOE-2.1E and support DOE-2.1E users.

Since 1996, DOE has been funding LBNL, the Univ. of Illinois, and others to develop EnergyPlus, new software intended to replace DOE-2 and BLAST. Building on the strengths of DOE-2 and BLAST (a DOD-sponsored energy analysis program), EnergyPlus includes a number of innovative simulation features, such as variable time step and modular systems that are solved simultaneously with a heat balance-based zone simulation. Currently in the alpha-testing phase, with beta testing expected later this year, we expect to release EnergyPlus in the year 2000. To make it easy for current DOE–2 and BLAST users to move to EnergyPlus, we have written utilities that convert BLAST and DOE–2 input files to the new EnergyPlus input structure. As mentioned above, in the interim and for some time after EnergyPlus is released, we will continue to support DOE-2.1E and its users.

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Energy Efficiency and Renewable Energy
US Department of Energy

2 July 1999

What's Inside ?

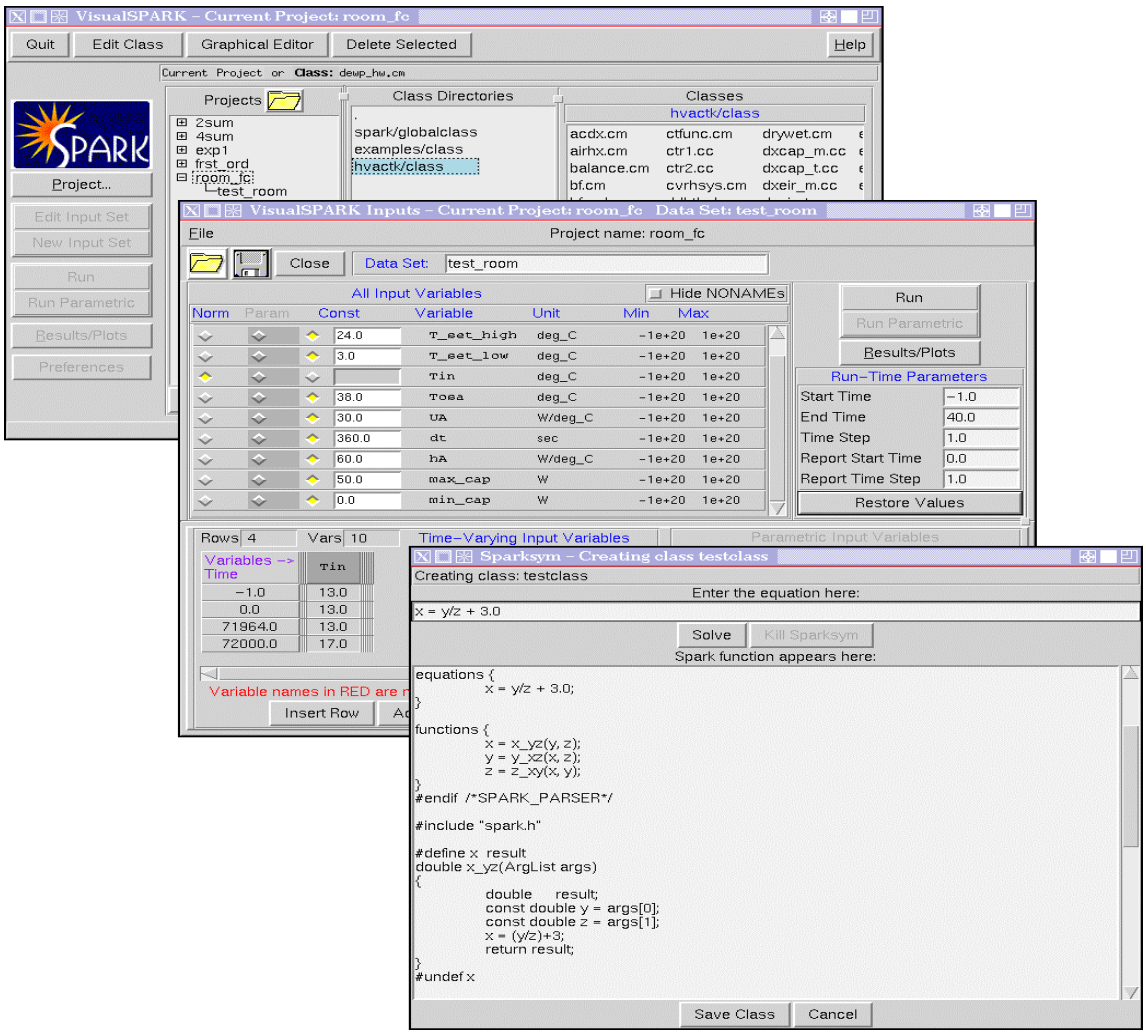
The *Building Energy Simulation User News* is published quarterly by the Simulation Research Group at Lawrence Berkeley National Laboratory with cooperation from the Building Systems Laboratory at the University of Illinois. Direct comments or submissions to Kathy Ellington, MS: 90-3147, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, or email KLEllington@lbl.gov or fax us at (510) 486-4089. Direct BLAST-related inquiries to the Building Systems Laboratory, email support@blast.bso.uiuc.edu or phone (217) 333-3977 ☺ ☺ ☺ 7/99 2000

This work was supported by the Assistant Secretary for Energy Efficiency and Renew-able Energy, Office of Building Technology, State and Commun-ity Programs, Office of Building Systems of the U.S. Department of Energy, under Contract No. DE-AC03-76SF00098.Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, University of California, Berkeley, CA 94720 USA

VisualSPARK

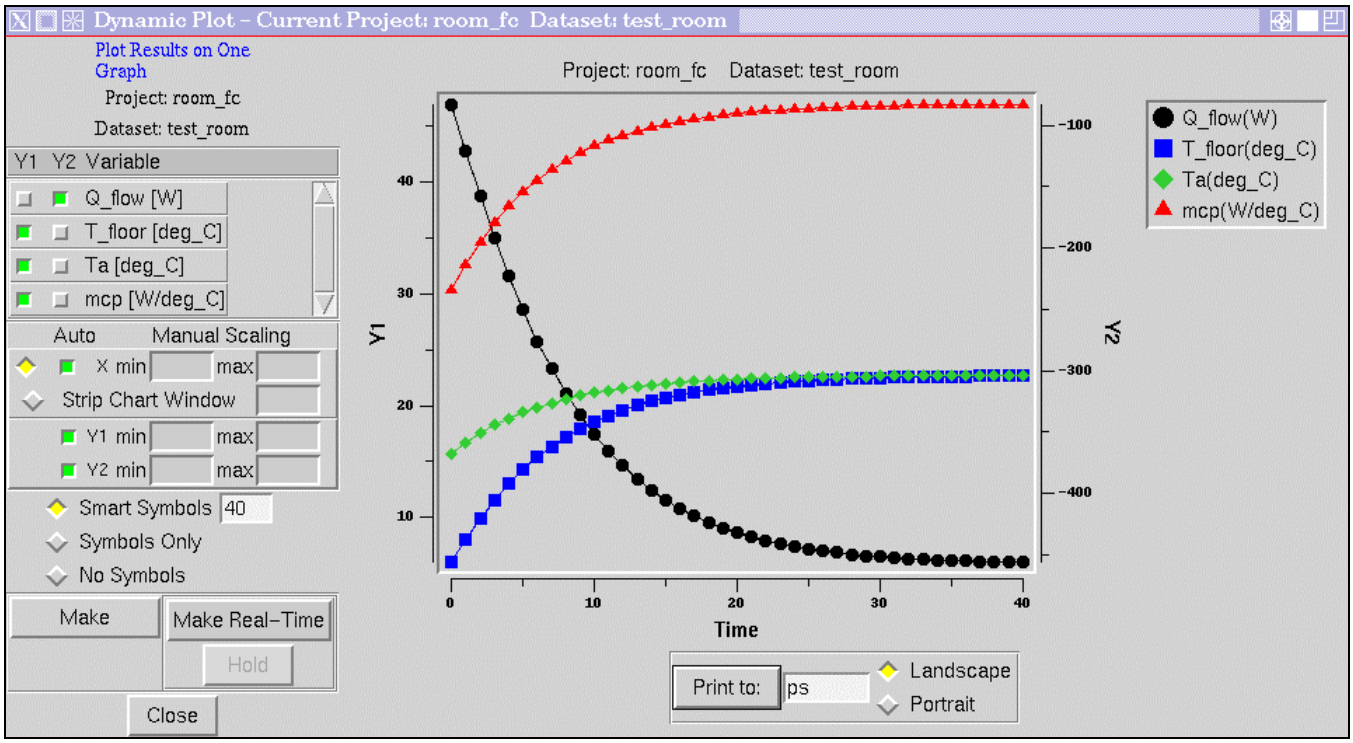
Ready for Beta Testing

VisualSPARK allows you to build models of complex physical processes by connecting calculation objects. It is aimed at simulation of innovative and/or complex building systems that are beyond the scope of programs like DOE-2 and BLAST. The main elements of VisualSPARK are a user interface, a network specification language, an object library containing calculation modules for building components, a solver for solving the set of simultaneous algebraic and differential equations that correspond to the physical problem being simulated, a results display processor for graphically plotting results and an interactive graphical editor (not available in the initial beta release of VisualSPARK). With the network specification language or the graphical editor you link the calculation objects into networks that represent a building's envelope and/or HVAC systems. VisualSPARK was developed by the LBNL Simulation Research Group and Ayres Sowell Associates, with the support from the U.S. Department of Energy.



Sample VisualSPARK input screens. Management of projects and classes is done on the back screen. In the middle screen you assign values to input variables. In the front screen you create a calculation class by entering an equation symbolically; SPARK automatically converts the equation to C-code.

VisualSPARK differs from programs like BLAST and DOE-2 in several important respects: (1) its time step can be as small or large as you want, consistent with the dynamics of the problem being simulated; (2) it uses an iterative solution that can easily handle non-linear systems; (3) it is equation based and so can simulate arbitrarily complex systems that can be described by sets of algebraic and differential equations; and (4) its algorithms are not hard-wired, which means you can customize it to particular simulation problems. To help you get started, VisualSPARK comes with an object library of basic HVAC components like fans, mixing boxes, heat exchangers, coils, chillers, cooling towers and controls that you can assemble into complete HVAC systems.



Example plot of VisualSPARK calculation results. There are several plotting options, including real-time plots that are displayed and updated as the simulation is running.

To run the UNIX version of VisualSPARK, you will need a computer running the SunOS, Solaris, Linux, or HPUNIX operating systems. To run the PC version of VisualSPARK, you will need a computer running the Windows 95, 98 or NT operating system. Both versions require a minimum of 30MB of disk space.

There is no charge for the beta version of VisualSPARK; however, a signed beta test license agreement must have been received by the Simulation Research Group at Lawrence Berkeley National Laboratory prior to testing. The agreement and all the instructions may be downloaded from

http://gundog.lbl.gov > SPARK > I Want To Test VisualSPARK > License Agreement

After the agreement is received, you will be emailed a password. If you would like to get an idea of what SPARK does before testing VisualSPARK, you can take a look at the SPARK User's Manual which can be downloaded from http://gundog.lbl.gov > SPARK > SPARK User's Manual.

Surface Temperature Calculation in DOE-2.1E

by
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Introduction

The original version of *DOE-2.1E* did not calculate inside surface temperatures because of the weighting factor approach [1]. However, the wall and window surface temperatures are important in order to correctly estimate radiant temperature as one of the key elements in a thermal comfort evaluation. Therefore, in the framework of the Swiss national project NEFF 640, a model that calculates the surface temperatures has been developed and the required routines have been added to DOE-2.1E. The work was partly performed at Lawrence Berkeley National Laboratory in cooperation with the Simulation Research Group.

Model

The model is based on an energy balance on the wall surfaces. The different heat fluxes are shown in Fig. 1. *DOE-2.1E* does not take into account the separate radiative heat exchange between the room surfaces, $\dot{q}_w$ (see list of symbols at the end of this article); instead, as shown in Fig. 2, a combined convective and radiative film coefficient h is used.

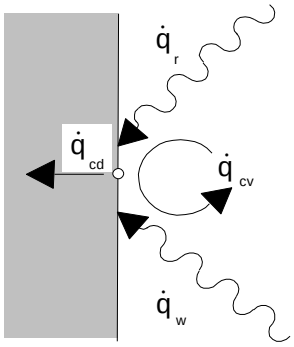


Fig. 1 Heat fluxes at the wall surface

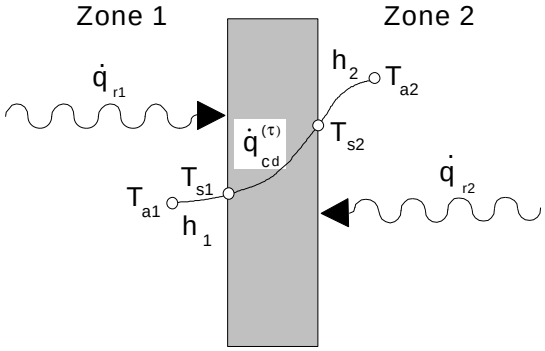


Fig. 2 Temperature distribution and radiant heat flux for an interior wall (DOE-2.1 E model).

Heat conduction at the wall surfaces is described by response factors [1] as follows:

$$\dot{q}_{cd1}^{(t)} = \sum_{i=0}^{n} X_i^{'} \cdot T_{s1}^{(t-i\cdot\Delta t)} - \sum_{i=0}^{n} Y_i^{'} \cdot T_{s2}^{(t-i\cdot\Delta t)} + CR \cdot \dot{q}_{cd1}^{(t-\Delta t)} \qquad (1)$$

$$\dot{q}_{cd2}^{(t)} = \sum_{i=0}^{n} Y_i^{'} \cdot T_{s1}^{(t-i\cdot\Delta t)} - \sum_{i=0}^{n} Z_i^{'} \cdot T_{s2}^{(t-i\cdot\Delta t)} + CR \cdot \dot{q}_{cd2}^{(t-\Delta t)} \qquad (2).$$

The surface temperatures can be calculated from an energy balance on both sides of the wall:

$$\begin{bmatrix} -X_0^{'} - h_1 & Y_0^{'} \\ Y_0^{'} & -Z_0^{'} - h_2 \end{bmatrix} \cdot \begin{pmatrix} T_{s1} \\ T_{s2} \end{pmatrix} = \begin{bmatrix} \sum_{i=1}^{n} X_i^{'} \cdot T_{s1}^{(t-i\cdot\Delta t)} - \sum_{i=1}^{n} Y_i^{'} \cdot T_{s2}^{(t-i\cdot\Delta t)} + CR \cdot \dot{q}_{cd1}^{(t-\Delta t)} - h_1 \cdot T_{a1} - \dot{q}_{r1} \\ -\sum_{i=1}^{n} Y_i^{'} \cdot T_{s1}^{(t-i\cdot\Delta t)} + \sum_{i=1}^{n} Z_i^{'} \cdot T_{s2}^{(t-i\cdot\Delta t)} - CR \cdot \dot{q}_{cd2}^{(t-\Delta t)} - h_2 \cdot T_{a2} - \dot{q}_{r2} \end{bmatrix} \qquad (3).$$

The right side of the system of equations (3) contains only surface temperatures and conduction heat fluxes from previous time steps. The zone air temperature and the radiative heat flux to the wall for the current time step are output values of the regular *DOE-2* program and therefore also known.

Comparison with measurements

The model has been compared with measured data sets used in the validation efforts within IEA-ECB Annex 21 [2] and with measurements from the Pala test houses [3].

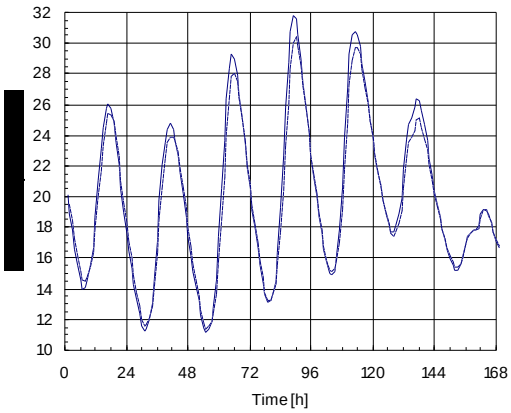
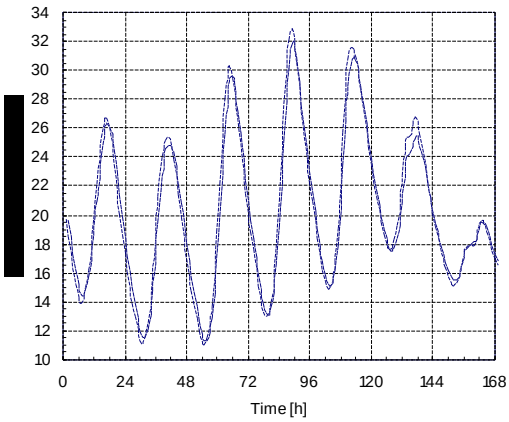


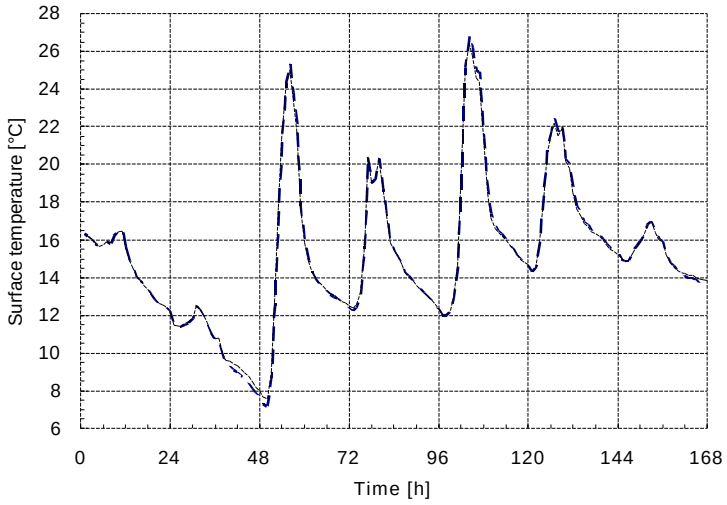
Fig. 3 Inside surface temperature of the ceiling.



___ DOE-2.1E Simulation
- - - IEA Test Cell Measurements

Fig. 4 Inside surface temperature of an exterior wall.

For the IEA test cell [2], figures 3 and 4 show good agreement between the measurements and the simulation. Additional comparisons have been made with a window model developed for the TRNSYS building simulation program [4]. The calculated window surface temperature for quadruple-pane low-E glazing was compared with the result of the surface temperature routine in *DOE 2.1E* and showed excellent agreement (Fig. 5).



___ DOE-2.1E Simulation
- - - TRNSYS Type 97 with DOE-2.1 E Window model

Fig. 5 Window inside surface temperature.

Keywords for DOE-2.1E Surface Temperature Calculation

BUILDING-LOCATION Command

SURF-TEMP-CALC Defines whether the surface temperature calculation is performed. Allowable code-words are YES and NO (the default).

EXTERIOR-WALL, WINDOW, DOOR UNDERGROUND-WALL, INTERIOR-WALL Commands

INSIDE-SURF-TEMP To trigger an inside surface temperature calculation for a particular envelope element, you use the INSIDE-SURF-TEMP keyword in the EXTERIOR-WALL, WINDOW, DOOR UNDERGROUND-WALL and INTERIOR-WALL commands. However, the calculation is not performed for the INTERIOR-WALL types INTERNAL and AIR.

Defines whether inside surface temperature values are written to a separate output file or not. The allowable code-words are YES and NO (the default).

The values are written to the file fort.16 in UNIX and to file for016.dat in VAX/VMS. In Windows, the file name to which the values are written depends on the compiler being used.

This is the format used for UNIX and VAX/VMS:

```
        ROOM  S-TR  S-TR        ROOM  WIN-  WIN-        ROOM  S-TR   S-TR  ROOM
        -1    -C45  -C45        -1    1     1           -1    -C02   -C02  -2

521 1  27.3  27.0  20.2  21.7  27.3  22.8 -17.8  21.7  27.3  27.0  21.4  21.0
521 2  26.7  26.4  20.2  21.7  26.7  22.6 -17.8  21.7  26.7  26.4  21.4  21.0

(1)          (2)   (3)   (4)   (5)   (2)   (6)   (7)   (5)    (2)   (3)   (8) (9)
```

1 Month, day, hour

2 Zone air temperature

3 Wall inside surface temperature

4 Wall outside surface temperature

5 Outside air temperature

6 Window inside surface temperature

7 Window outside surface temperature (not available in the current version and therefore 0°F or -17.8°C)

8 Wall surface temperature in NEXT-TO zone (for INTERIOR-WALLs)

9 Air temperature in NEXT-TO zone (for INTERIOR-WALLs)

The routine calculates the mean radiative temperature for every zone as the area-weighted average of the inside surface temperatures and makes it available as an additional zone hourly report variable in Systems. Also, the operative temperature, defined as the average of the zone air temperature and the mean radiative temperature, is calculated and available as an hourly report variable.

Hourly-Report Variable List in Systems

VARIABLE-TYPE = u-name of ZONE

Variable-List Number	Variable in FORTRAN Code	Description
91	TMR	Mean radiative temperature
92	TEFF	Operative temperature

List of Symbols

CR	Common ratio	$[-]$
h	Combined film coefficient (convective and radiative)	$\left[W/\left(m^2K\right)\right]$
$\dot{q}_{cd}^{(t)}$	Wall conduction	$\left[W/m^2\right]$
$\dot{q}_{cv}$	Convective heat flux	$\left[W/m^2\right]$
$\dot{q}_r$	Radiative heat flux from people, equipment and solar radiation	$\left[W/m^2\right]$
$\dot{q}_w$	Radiative heat flux from other surfaces	$\left[W/m^2\right]$
T_a	Air temperature	$[K]$
T_s	Surface temperature	$[K]$
t	Time	$[h]$
Δt	Time step	$[h]$
X', Y', Z'	Surface to surface response factors	$\left[W/\left(m^2K\right)\right]$

References

[1] *DOE-2 Engineers Manual, Version 2.1A*, Lawrence Berkeley National Laboratory, University of California, Berkeley, CA. November 1982. [DE-830-04575 available from www.fedworld.gov/ntis/home.html]

[2] *Empirical Validation Data Sets 099 and 110 from EMC Test Room*, BRE (Building Research Establishment), IEA Annex 21, March 1992

[3] R. Meldem and F. Winkelmann, *Comparison of DOE-2 with Temperature Measurements in the Pala Test Houses*, Energy and Buildings 27 (1998) 69-81

[4] R. Weber und M. Koschenz, *Description of Type 97 for TRNSYS, Model for the Calculation of Multi-Layer Windows*, EMPA Abteilung Haustechnik, Dez. 1995

Energy Systems Engineering (ESE) is the site of the newest DOE-2 Resource Center, headed up by Jiten Prajapati (jiten@ me.iitb.ernet.in), Bachelor of Architecture, and Anil K. Anand, Bachelor of Technology (Mechanical). ESE specializes in the design of passive solar buildings, tool development for integrating simulation with design software, and consulting for the simulation of thermal performance of buildings.

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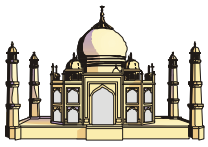
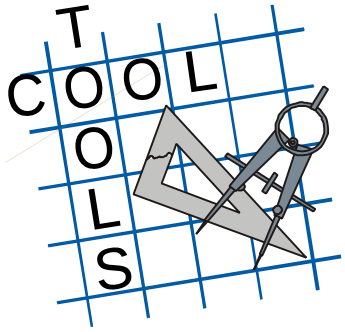


RESFEN 3.1 calculates the energy and cost implications of a building's windows compared to insulated walls. The relative energy and cost impacts of two different windows can also be compared against each other. RESFEN calculates the heating/cooling energy use and associated costs as well as the peak heating and cooling demand for specific window products. Users define a problem by specifying the house type (1- or 2-story), geographic location, orientation, electricity and gas cost, and building configuration details (such as wall type, floor type and HVAC systems). Window options are defined by specifying the window's size, shading, and thermal properties: U-factor, Solar Heat Gain Coefficient, and air leakage rate (User News, Vol. 18, No. 3). To get a free RESFEN 3.1 CD, please fax your request to Robin Mitchell at (510) 486-4089 or email RDMitchell@lbl.gov.



PACIFIC GAS & ELECTRIC COMPANY PRESENTS

CoolTools

A suite of HVAC analysis software for modeling chiller performance and energy efficiency.

Introduction to CoolTools

Pacific Gas & Electric Company (PG&E) of San Francisco, CA, has initiated a market transformation effort under the name "CoolTools," with the objective to develop, disseminate and promote an integrated set of tools for the design and operation of chilled water plants. CoolTools products are software programs, publications and support services that together provide an objective analytical method for comparing alternatives during the design and operation of chilled water systems. CoolTools supports a new standard of practice for achieving cost effective and efficient equipment selection, system design and operating scenarios. The products are Internet based, public domain resources, and are targeted to building owners, design professionals, and operators involved in both new construction and retrofits.

Objectives

The CoolTools Project was designed to raise the bar of standard practice. Our objectives include:

- Improving the accuracy, application, and functionality of simulation tools which are used to compare the energy impact of central chilled water plant design, equipment, and control options.
- Providing easily used, unbiased, and objective analytical methods whose functionality is consistent with the level of effort and expertise in current design process.
- Empowering building owners, facility managers, ESCOs, design professionals, and others to optimize their chilled water plants based on energy cost performance.
- Integrating tools and techniques into present tools, codes, and standards to provide lasting benefits and to facilitate use.
- Collaborating with national organizations to validate the underlying methods and accelerate the transition into the marketplace.

Computer-based Tools

At the core of the toolkit are computer-based tools that are tuned to either manufacturer or field-monitored data. These modular tools can interface with design evaluation tools currently in use. The modules integrate into a stand-alone simulation program that provides an hourly energy cost analysis of chilled water plant equipment and control alternatives.

Guidelines and Case Studies

Guidelines and cases studies are being developed to inform owners, designers, and operators how to achieve the most cost-effective and efficient equipment selection, system design, and operating scenario for both new construction and retrofit applications.

- A decision maker's guide will define, in the financial terms of the decision maker, the opportunities and necessary steps to deliver cost-effective chilled water plants.
- A comprehensive project implementation plan will characterize the formula for success, outlining each player's role and detailing the related elements of the toolkit.
- Case studies will encourage users to incorporate the proposed tools.
- A chilled water plant design guide will contain detailed design information and sample specification language.

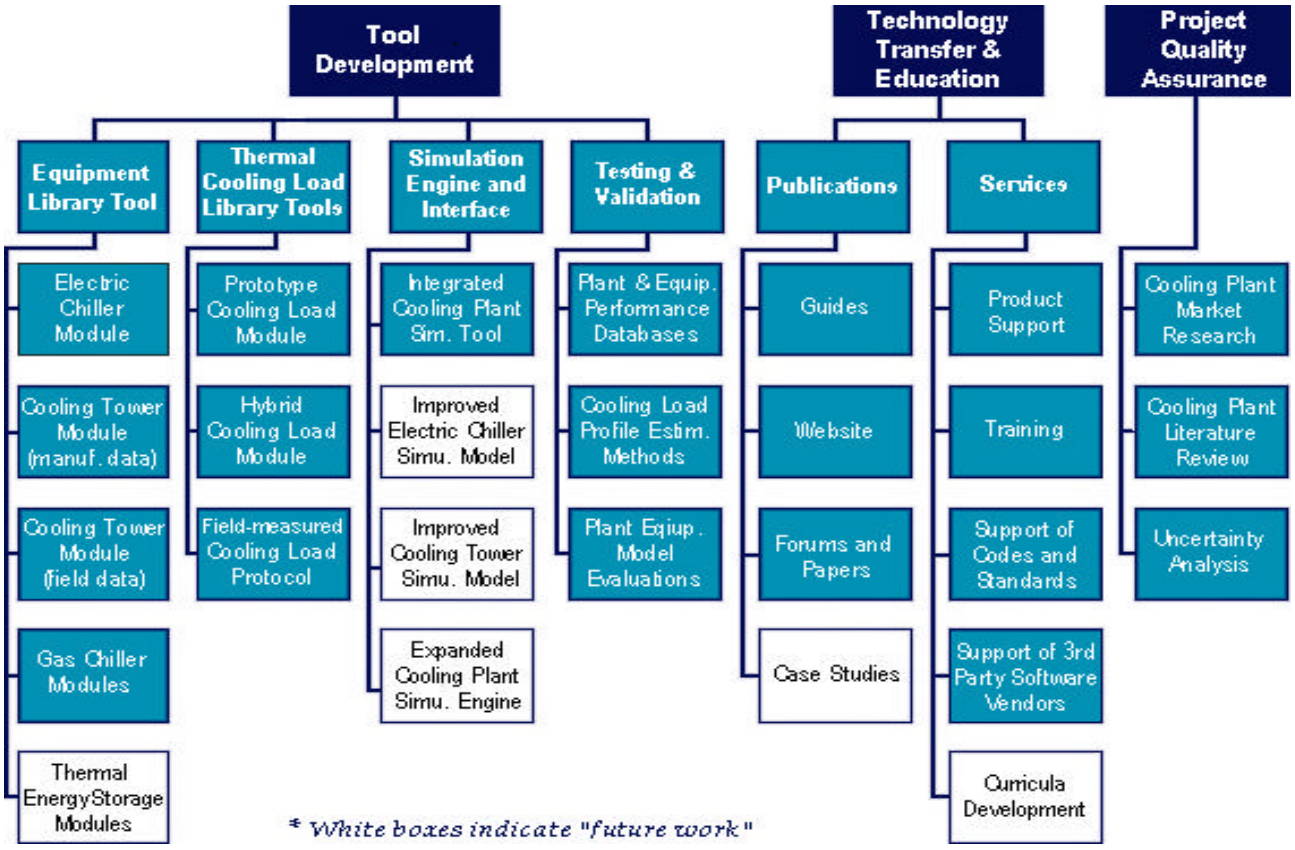


Figure 1: Components of the CoolTools Project
This chart depicts the variables of the CoolTools Project. The white boxes represent deliverables that the project team would like to include in future phases of the project, but that are not part of the current scope of work.

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blastnews

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The **Building Loads Analysis and System Thermodynamics (BLAST)** system is a comprehensive set of programs for predicting energy consumption and energy system performance and cost in buildings. The BLAST system was developed by the U.S. Army Construction Engineering Research Laboratory (USACERL) under the sponsorship of the Department of the Air Force, Air Force Engineering and Services Center (AFESC), and the Department of the Army, Office of the Chief of Engineers (OCE). After the original release of BLAST in December 1977, the program was extended and improved under the sponsorship of the General Services Administration, Office of Professional Services; BLAST Version 2.0 was released in June 1979. Under the sponsorship of the Department of the Air Force, Aeronautical System Division, and the Department of Energy, Conservation and Solar Energy Office, the program was further extended; BLAST Version 3.0 was completed in September 1980. Since 1983, the BLAST system has been supported and maintained by the Building Systems Laboratory at the University of Illinois at Urbana-Champaign.

BLAST can be used to investigate the energy performance of new or retrofit building design options of almost any type and size. In addition to performing peak load (design day) calculations necessary for mechanical equipment design, BLAST also estimates the annual energy performance of the facility, which is essential for the design of solar and total energy equipment design, BLAST also estimates the annual energy performance of the facility, which is essential for the design of solar and total energy (cogeneration) systems and for determining compliance with design energy budgets. Repeated use of BLAST is inexpensive; it can be used to evaluate, modify, and re-evaluate alternate designs on the basis of annual energy consumption and cost.

The BLAST analysis program contains three major subprograms:

- The Space Load Prediction subprogram computes hourly space loads in a building based on weather data and user inputs detailing the building construction and operation.
- The Air Distribution System Simulation sub-program uses the computed space loads, weather data, and user inputs describing the building air- handling system to calculate hot water, steam, gas, chilled water, and electric demands of the building and air-handling system.
- The Central Plant Simulation subprogram uses weather data, results of the air distribution system simulation, and user inputs describing the central plant to simulate boilers, chillers, on-site power generating equipment and solar energy systems; it computes monthly and annual fuel and electrical power consumption.

Heat Balance Loads Calculator (HBLC)
The BLAST graphical interface (HBLC) is a Windows-based interactive program for producing BLAST input files. HBLC allows the user to visualize the building model as it is developed and modify previously created input files. Within HBLC, each story of the building is represented as a floor plan which may contain several separate zones. Numerous other building details may be investigated and accessed through simple mouse operations. On-line helps provide valuable on-the-spot assistance that will benefit both new and experienced users. HBLC is an excellent tool which will make the process of developing BLAST input files more intuitive and efficient. You can download a demo version of HBLC (for MS Windows) from the BLAST website (User manual included!).

HBLC/BLAST Training Courses
Experience with the HBLC and the BLAST family of programs has shown that new users can benefit from a session of structured training with the software. Such training helps to define the steps necessary to produce accurate and consistent output from BLAST and its auxiliary programs and gives users a solid foundation from which they can explore the more advanced features of the program with confidence. The Building Systems Laboratory offers such training courses on an as needed basis typically at our offices in Urbana, Illinois and lasting 2 or 3 days depending on the specific needs of the participants. Call the Building Systems Laboratory for additional information on pricing and availability.

WINLCCID 98
LCCID (Life Cycle Cost in Design) has been a standard in the DOD community since its initial release in 1986. LCCID was developed to perform Life Cycle Cost Analyses (LCCA) for the Department of Defense and their contractors, yet it goes far beyond being just a DOD study tool by providing many features of a general purpose life cycle costing tool. With LCCID, it's easy to carry out "what-if" analyses based on variables such as present and future costs and/or maintenance and repair costs. LCCID allows an analysis based on standard DOD procedures and annually updated escalation factors as well as Energy Conservation Investment Program (ECIP) LCCA. You can download a demo version of WINLCCID 98 (for MS Windows) from the BLAST website http://www.bso.uiuc.edu [see *User News* Vol. 16, No. 4, p. 5]

To order BLAST-related products, contact the Building Systems Laboratory at the address above.

Program Name	Order Number	Price
PC BLAST Package The standard PC BLAST Package includes: BLAST, HBLC, BTEXT, WIFE, CHILLER, Report Writer, Report Writer File Generator, Comfort Report program, Weather File Reporting Program, Control Profile Macros for Lotus or Symphony, and the Design Week Program. The package is on a single CD-ROM and also includes soft copies of the BLAST Manual, 65 technical articles and theses related to BLAST, nearly 400 processed weather files with a browsing engine, and complete source code for BLAST, HBLC, etc. Requires an IBM PC 486/Pentium II or compatible running MS Windows 95/98/NT.	3B486E3-0898	$1500
PC BLAST Package Upgrade from level 295+	4B486E3-0898	$450
WINLCCID 98: executable version for 386/486/Pentium	3LCC3-0898	$295
WINLCCID 98: update from WINLCCID 97	4LCC3-0898	$195

The last four digits of the catalog number indicate the month and year the item was released or published. This will enable you to see if you have the most recent version. All software will be shipped on 3.5" high density floppy disks unless noted otherwise.

Announcing A Freeware Spreadsheet Pre/Post Processor For DOE-2.1E

Quickee 1.0 from GeoPraxis, Inc.

Energy simulation tools developer GeoPraxis, Inc. is giving away (!) a simple DOE-2 freeware utility which can make using DOE-2 easier, more efficient and consistent. The simple Visual Basic 6.0 utility runs in MS Excel 97 (also requires MS Word 97) and is compatible with the J.J. Hirsch version of DOE-2.1E. Quickee allows you to quickly specify input file, weather file and DOE-2 executable file directories. Then you select, view, edit and run the DOE-2 files in those directories. Quickee also allows you to quickly manage multiple simulation runs and weather files. In addition, because the utility is created in a spreadsheet, you can easily customize the presentation output and make comparisons of parametric runs without needing to know a programming language.

The main screen of Quickee manages your DOE-2 file locations and contains buttons to instantly carry out these repetitive tasks:

- Run DOE-2 BDL
- Run DOE-2 simulation
- Edit/View the DOE-2 input (*.inp) file
- Edit/View the DOE-2 BDL file and find errors
- Edit/View the DOE-2 *.22 file
- Edit/View the DOE-2 output (*.out) file
- Plot monthly electrical, gas power and energy end-use output
- View the DOE-2 weather file statistics

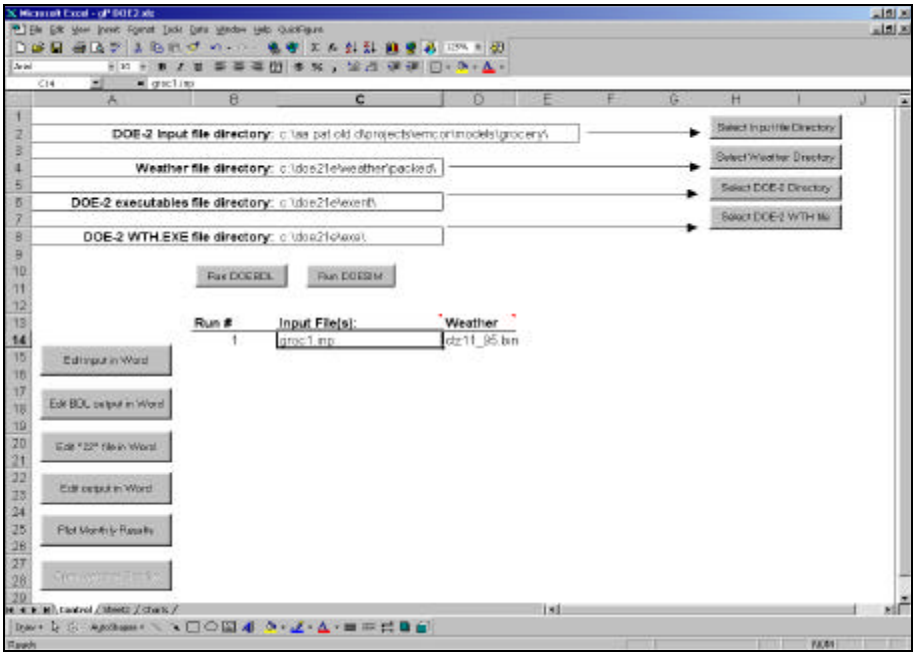


Figure 1: The main screen of Quickee

Quickee allows you to specify over 65,000 input and associated weather file combinations that are to be run, analyzed and catalogued.

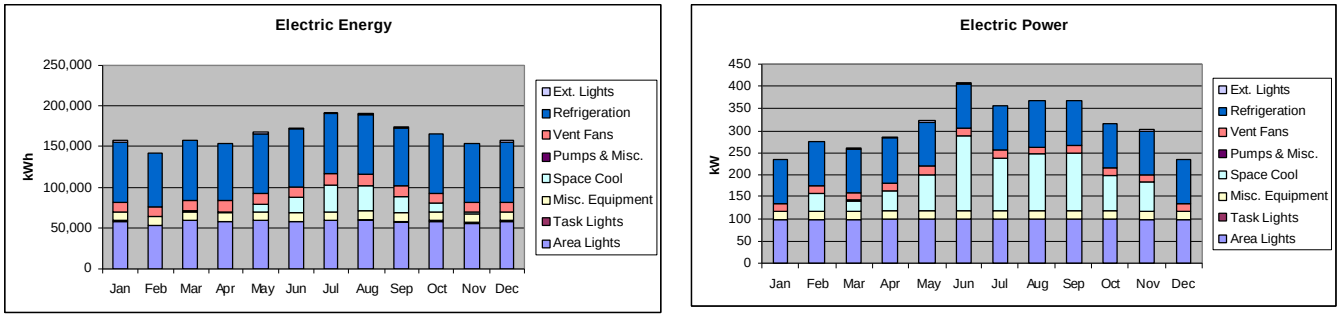


Figure 2: Simulation results (from standard DOE-2 PS-E reports) are placed in a new worksheet where bar graphs, that are automatically generated, show monthly power and energy by end use.

DOE-2 users are invited to visit www.geopraxis.com to learn more about Quickee 1.0 and download a copy. Questions and comments may be directed to John Kennedy or Tom Conlon at GeoPraxis, 461-7th Street West, Suite 1, Sonoma, CA 95476. Phone: (707) 996-9408, Fax: (707) 939-8702, jfk@geopraxis.com.

VISUALDOE 3.0

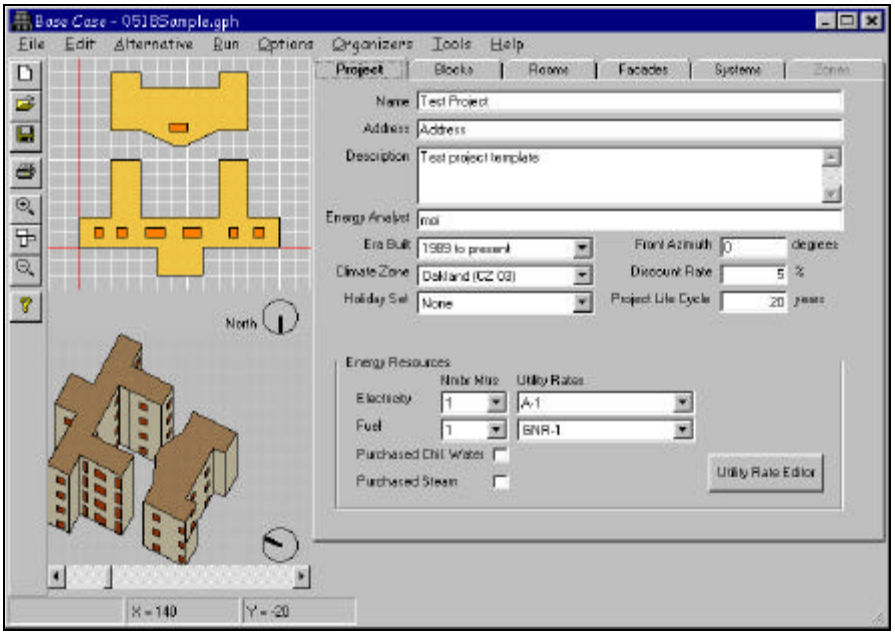
Charles Eley, FAIA, PE
Eley Associates
San Francisco, CA

VisualDOE 3.0 is a third-generation DOE-2 Windows application that enables building professionals to quickly evaluate the energy savings of design options. The program has evolved over the years. Version 1.0 was released in 1994 with limited capabilities (see *User News*, Vol. 16, No. 4). Version 2.0 was released in early 1996 (see *User News*, Vol. 15, No. 2) with Version 2.5 adding a number of significant features in the Fall of 1996. Version 3.0 is available now.

VisualDOE is used by hundreds of architects, engineers, utility personnel, energy service companies and others to quickly and accurately build energy simulation models that harness the power of DOE-2. VisualDOE has eliminated the need for you to labor over creating and/or positioning individual surfaces. Instead, you work with blocks that represent a group of rooms, complete with correctly positioned surfaces, windows, lighting systems, and other modeling features. Blocks can be stretched, stacked and otherwise arranged to create just about any building configuration.

Version 3.0, a complete overhaul of the program, is a 32-bit program that works with the Windows 95, 98 and NT operating systems. On the surface the program looks similar to Version 2.0. The main visual difference is that the four elevation views have been replaced by a single isometric view, which can be rotated to expose all sides of the building. Multiple plan views have been combined into a single view that can display one or more blocks simultaneously. Like before, you can see the physical character-istics of your model as you build it.

VisualDOE 3.0 continues to support popular Version 2.0 features. You can use either inch-pound or SI (metric) units and eliminate time consuming conversions.



EXAMPLE VISUALDOE 3.0 SCREEN

The VisualDOE library can be modified to include special holidays, schedules, equipment templates and other information unique to a particular country or region of the world. In many cases an entire piece of equipment such as a chiller, boiler or cooling tower can be specified by making a single choice in the templates list box.

Perhaps the most important new feature is the ability to use multiple simulation engines. The program continues to work with DOE-2.1E but in the future the program can be adapted to work with EnergyPlus, for example, when it becomes available. When a design alternative is specified, a simulation engine is selected for that alternative.

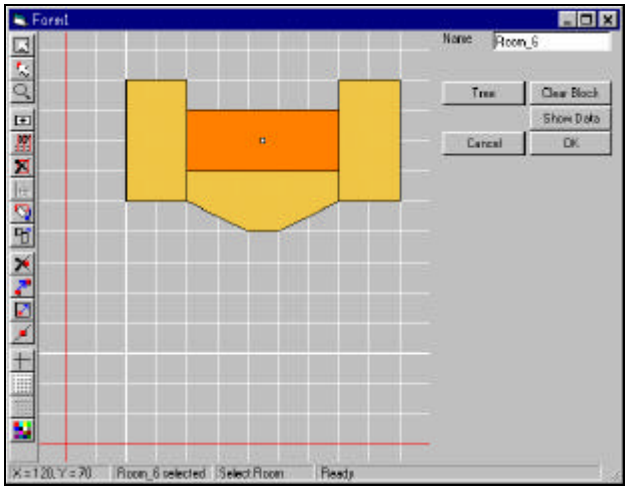
Each project file contains information about the base case design and up to 20 design alternatives. Design alternatives can be quickly created from the base case or one of the other design alternatives. VisualDOE will calculate the life-cycle cost of each alternative if first cost data is provided.

Scheduling building operation patterns in VisualDOE is vastly simpler than using DOE-2 directly. An occupancy type is chosen from the library and all the schedules and other information associated with that occupancy type are automatically applied. The Schedule Maker program module can be used to create new schedules and combine these into occupancies.

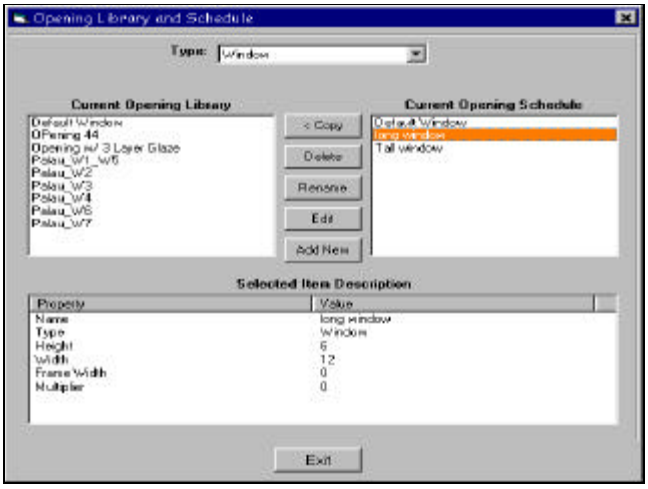
The program is supported by an on-line help system that explains how to use the program and gives details about information needed to perform a simulation. The help system is context sensitive, providing immediate information

about the form displayed on the screen. Error checking is provided after you enter information in each field. VisualDOE generates its own special reports and graphs, in addition to the standard reports from DOE-2. Diagnostic information is provided to help you assure that your results are reasonable. Eley Associates provides technical assistance to all users.

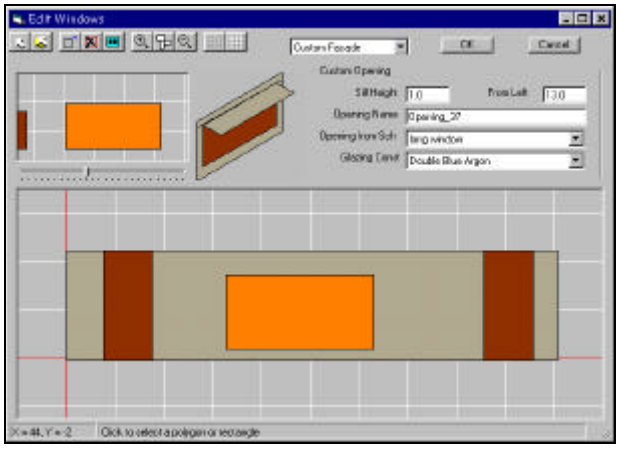
VisualDOE 3.0 Features



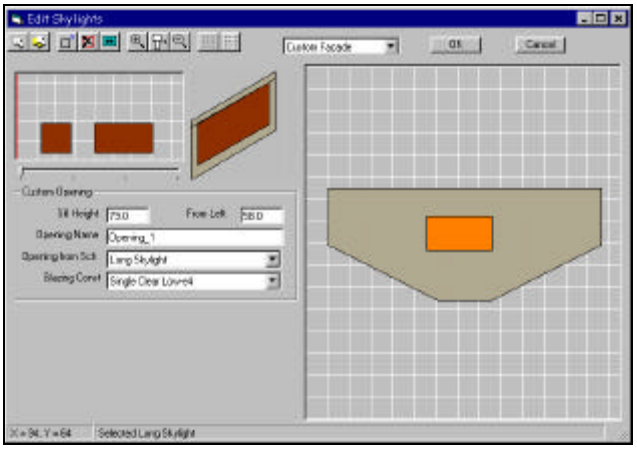
The **custom block editor** allows the creation of complicated block shapes by stretching two point rectangles, clicking a polygon, entering coordinates or importing data from CADD files. Blocks can also be rotated, standard blocks can be converted to custom blocks and modified, rooms can be combined or merged, vertices can be dragged to change shapes, and daylight reference points can be positioned with the mouse.



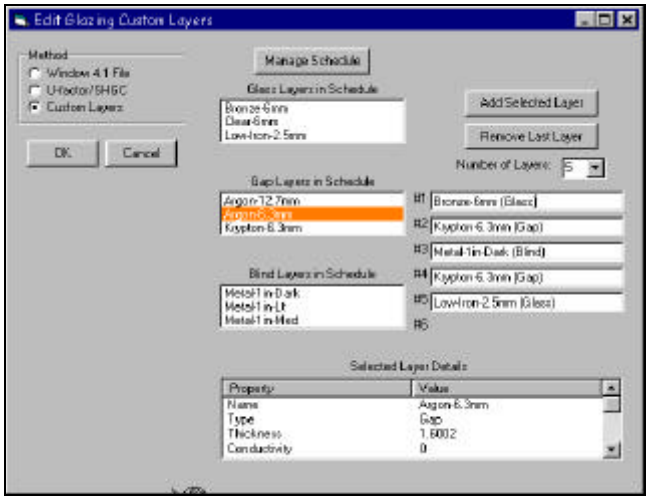
Common elements that are repeated in a building model can be created once, placed in a schedule, and then referenced where they are needed. Schedules are included for openings (windows or skylights), glazing materials, window layers, lighting systems, luminaires, and lamps. An organizer enables elements to be copied from a master library to your project file or vice versa.



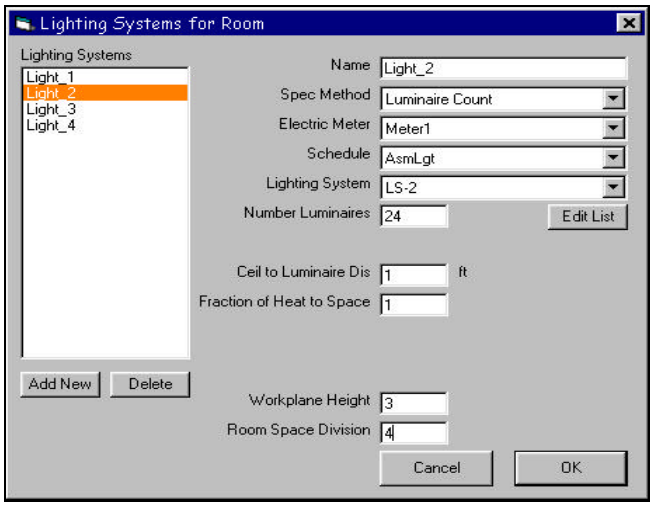
Create **custom facades** with windows of any size or configuration. An elevation view of the selected façade is displayed. Then, an image of each opening in the schedule appears in a window; these can be dragged and dropped onto the façade at any position. The process is repeated until all the windows are correctly positioned. Windows can also be repositioned and a snap-to-grid feature insures accurate placement.



Skylights can be created for rooms with exposed roofs. Since most spaces in commercial buildings have plenums, VisualDOE creates a special “skylight holder” surface to contain the skylight. The Skylight Editor works like the custom façade editor. Individual skylights are dropped onto the plan view of the room, where they can subsequently be accurately positioned with the Move tool.



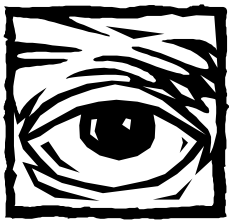
Window Constructions can be built up from layers. Formerly this required a separate analysis by **WINDOW 4.1**. Now users can build up a window by combining layers, similar to defining constructions using layers. Layers can include glazing material, but also gaps (filled with air or other gasses) and blinds.



Up to five **lighting systems** can be defined in each room. These can be specified by choosing a luminaire type and entering the number. You can indicate the desired lighting level and let the program determine the number of luminaires. You can also enter the lighting power density of the space, as in DOE-2.1E.

Minimum System Requirements

- Pentium processor with color monitor and mouse.
- Windows 95 or higher.
- 32 mb random access memory (RAM).
- 40 mb disk space. (The program takes about 20 mb, in addition, about 20 mb of temporary space is needed to make simulations.)



For More Information

Send an email to VisualDOE@eley.com or call Eley Associates at (415) 957-1977. Special pricing is offered to current VisualDOE users, students and educators.

What's New ?

❖ **VisualSPARK ...**

VisualSPARK is ready for beta testing. Please turn to the article on p. 2 for details.

❖ **Become an EnergyPlus Developer ...**

Interested in developing an interface for EnergyPlus or adding specialized calculation modules to it? Then all you need to do is execute an EnergyPlus developers license by going to

http://gundog.lbl.gov > EnergyPlus

You will be able to access the EnergyPlus source code and development guides.

❖ **SRG Website ... http://gundog.lbl.gov/**

Please check out our website. In addition to the snazzy home page, there are links to technical reports, the *User News*, software, and up-to-date descriptions of our current research.

Also, all DOE-2.1E documentation corrections, bug fixes and how-to articles from the *User News* have been combined into one PDF document. In addition, the DOE-2 weather processor has been updated and rewritten. Both documents are available for download (the update is 67 pages, the weather processor is 22 pages). If you prefer to receive printed copies, email KLEllington@lbl.gov.

Some reader services that used to be printed in the newsletter have been moved to the web. So far, these include sources
for weather data, list of URLs for building energy efficiency, and DOE-2 documentation ordering information.

Recent LBNL Reports

These reports are available free of charge from the LBNL Building Technologies Department. Please direct fax requests to Pat Ross at (510) 486-4089

LBNL-42871

Residential Fenestration Performance Analysis Using RESFEN 3.1

by

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Lawrence Berkeley National Laboratory
Berkeley, CA 94720

Abstract

This paper describes the development efforts of *RESFEN 3.1*, a PC-based computer program for calculating the heating and cooling energy performance and cost of residential fenestration systems. The development of *RESFEN* was coordinated with ongoing efforts by the National Fenestration Rating Council (NFRC) to develop an energy rating system for windows and skylights to maintain maximum consistency between *RESFEN* and NFRC's planned energy rating system. Unlike previous versions of *RESFEN*, that used regression equations to replicate a large data base of computer simulations, Version 3.1 produces results based on actual hour-by-hour simulations. This approach has been facilitated by the exponential increase in the speed of personal computers in recent years. *RESFEN 3.1* has the capability of analyzing the energy performance of windows in new residential buildings in 52 North American locations. The user describes the physical, thermal and optical properties of the windows in each orientation, solar heat gain reductions due to obstructions, overhangs, or shades, and the location of the house. The *RESFEN* program then models a prototypical house for that location and calculates the energy use of the house using the DOE-2 program. The user can vary the HVAC system, foundation type, and utility costs. Results are presented for the annual heating and cooling energy use, energy cost, and peak energy demand of the house, and the incremental energy use or peak demand attributable to the windows in each orientation. This paper describes the capabilities of *RESFEN 3.1*, its usefulness in analyzing the energy performance of residential windows and its development effort and gives insight into the structure of the computer program. It also discusses the rationale and benefits of the approach taken in *RESFEN* in combining a simple-to-use graphical front-end with a detailed hour-by-hour "simulation engine" to produce an energy analysis tool for the general public that is user-friendly yet highly accurate.

* *Proc. Thermal VIII: Thermal Performance of the Exterior Envelopes of Buildings, Clearwater, FL, December 7-11, 1998.*

LBNL-42151

State-of-the-Art Software for Window Energy-Efficiency Rating and Labeling

by

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Abstract

Measuring the thermal performance of windows in typical residential buildings is an expensive proposition. Not only is laboratory testing expensive, but each window manufacturer typically offers hundreds of individual products, each of which has different thermal performance properties. With over a thousand window manufacturers nationally, a testing-based rating system would be prohibitively expensive to the industry and to consumers.

Beginning in the early 1990s, simulation software began to be used as part of a national program for rating window U-values. The rating program has since been expended to include Solar Heat Gain Coefficients and is now being extended to annual energy performance. This paper describes four software packages available to the public from Lawrence Berkeley National Laboratory. These software packages are used to evaluate window thermal performance:

1. **RESFEN** (for evaluating annual energy costs)
   http://windows.lbl.gov/software/resfen/resfen.html

2. **WINDOW** (for calculating a product's thermal performance properties)
   http://windows.lbl.gov/software/window/window.html

3. **THERM** (a pre-processor for WINDOW that determines two-dimensional heat-transfer effects)
   http://windows.lbl.gov/software/therm/therm

4. **OPTICS** (a pre-processor for WINDOW's glass database).
   http://windows.lbl.gov/materials/optics5/optics5.html

Software not only offers a less expensive means than testing to evaluate window performance, it can also be used during the design process to help manufacturers produce windows that will meet target specifications. In addition, software can show small improvements in window performance that might not be detected in actual testing because of large uncertainties in test procedures.

* *Proc. ACEEE '98 Summer Study on Energy Efficiency in Buildings, Pacific Grove, CA, August 23-28, 1998.*

DOE-2 Directory of Program Related Software and Services[1]

Mainframe/Workstation Versions of DOE-2

Program Name	Operating System	Description	
DOE-2.1E From the Energy Science and Technology Software Center (ESTSC)	SUN DEC-VAX	Source code, executable code and complete current documentation for: DOE-2.1E/Version 094 for SUN DOE-2.1E DEC-VAX	For a complete listing of the software available from ESTSC, order their "Software Listing" catalog, ESTSC-2. [See *User News* Vol. 16, No. 3, p. 21]
FTI/DOE (see FTI/DOE listing under PC Versions of DOE-2, below)			

PC Versions of DOE-2[2]

Program Name	Operating System	Description
ADM-DOE-2 Based on J.J. Hirsch DOE-2.1E	DOS Windows 95	ADM-DOE-2 (DOE-2.1E) is compiled for use on 386/486 PCs with a math co-processor and 4MB of RAM. The package contains everything needed to run the program: program files, utilities, sample input files, and weather files. More than 300 weather files are available (TMY, TRY, WYEC, CTZ formats) for the U.S. and Canada. [See *User News* Vol. 7, No. 2, p. 6]
Compare-IT Based on J.J. Hirsch DOE-2.1E	Windows (98, 95, NT)	Compare-IT allows DOE-2 professionals to add value to their projects by giving clients "what-if" scenarios using DOE-2. The interface is designed for novice energy analysts and the GUI can be customized for each client's particular interests. A tabbed main window is configured based on the user's DOE-2 macro organization. All labels, drop-down list boxes, tool-tips, error checking, and help files are created dynamically from a "Compare-IT-ized" DOE-2 input file. Output are tables and powerful graphs of annual costs, annual energy and end-use and hourly end-use values. [See *User News* Vol. 19, No. 1]
DOE-PLUS Based on J.J. Hirsch DOE-2.1E Demo: www.halcyon.com/byrne	DOS Windows (3.1, 95, NT)	Complete support for all DOE-2 commands. Imports BDL files created with a text editor or other program. Interactive error checking. 3-D view of building can be rotated and zoomed. Windows, walls, etc., identified by DOE-2 U-name and allow component editing. User-defined libraries of schedules, HVAC systems, plant equipment, building components, etc. Exports results to spreadsheets and database programs. Graphical display of schedules. Utility programs included: Prep, Demand Analyzer, weather processor. Over 500 worldwide weather files. [See *User News* Vol. 13, No. 2, p. 54, Vol. 16, No. 1, p. 28-32]
EnergyPro Based on ESTSC DOE-2.1E V. 092 Demo: www.energysoft.com	Windows (95, NT)	Performs nonresidential load calculations for HVAC equipment sizing. Produces typeset quality reports/forms. Electronically exports forms to AutoCad for inclusion on blueprints. On-line help. 344 weather files for the U.S. and Canada. For California Users: Performs Title 24 compliance calculations, includes state-certified HVAC and DHW Equipment directories, Title 24 tailored lighting calculations. [See *User News* Vol. 18, Nos. 2, 4]
EZDOE Based on J.J. Hirsch DOE-2.1D Demo: www.elitesoft.com	DOS	Provides full screen, fill-in-the-blank data entry, dynamic error checking, context-sensitive help, mouse support, graphic reports, a 750-page user manual, and extensive weather data. EZDOE integrates the full calculation modules of DOE-2 into a powerful, full implementation of DOE-2 on DOS-based 386 and higher computers. On-line help. Includes some weather files. *[See User News Vol. 14, No. 2, p. 10 and No. 4, p. 8-14]*
FTI/DOE Based on ESTSC DOE-2.1E V. 092 No demo, 30-day trial period	DOS Windows (3.x, 95, NT) AIX, ULTRIX, VMS, Linux, NeXTStep,	FTI/DOE is 100% compatible with LBNL version. Highly optimized and extremely reliable. Version 3.1 will include a graphical user interface and will provide full command functionality and access to all reporting features of the original. Interface is Java-based and will be available for any system supporting Java. Source code versions will compile with most F77-compliant compilers. On-line help: Yes for Version 3.x, No for Version 2.x. 344 weather files for the U.S. and Canada. *[See User News Vol. 12, No. 4, p. 16]*
PRC-DOE-2 Based on J.J. Hirsch DOE-2.1E No demo	DOS Windows (95, NT)	This text-based version of DOE-2 is fast, reliable, and very up to date. Documentation includes 2.1E Supplement, 2.1E BDL Summary; original Reference Manual. Extensive information on new features is included on the disk as well, including information on new system types, new commands, new options, etc., added to later versions of 2.1E.
VisualDOE 3.0 Based on J.J. Hirsch DOE-2.1E, V. 083 Demo: www.eley.com	DOS Windows (3.1, 95, NT)	Dramatically faster construction of building geometry using pre-defined blocks and/or drawing interface. Import zone shapes from CADD file (dxf format). Point-and-click to define zone properties and HVAC systems. Define up to 20 design alternatives in each project file. View rotatable 3-D image of model. Create custom hourly output reports and customized graphs. Edit and expand library of constructions, schedules, equipment, and utility rates. Add custom performance curves. Network version allows sharing of libraries. On-line help. 400+ weather files for the U.S., 12+ weather files for Canada, plus selected locations around the world. *[See User News Vol. 15, No. 2, p. 10; Vol. 16, No. 4, p. 9-16; Vol. 17, No. 4]*

[1] We list third-party DOE-2-related products and services for the convenience of program users, with the understanding that the Simulation Research Group does not have the resources to check the DOE-2 program adaptations and utilities for accuracy or reliability.

[2] Note: the MicroDOE2 program is no longer available.

DOE-2 Directory of Program Related Software and Services

Mainframe/Workstations Versions of DOE-2

Input Output	Support	Program Price	Vendor Information
	Limited "operational" support, which includes telephone assistance concerning installation, media or platform questions.	SUN version: Govt/Educ $400 U.S., Mexico, Canada $1305 Other Foreign $2000 VAX version: Govt/Educ $500 U.S., Mexico, Canada $1835 Other Foreign $2716	**Energy Science & Tech Software Center** P.O. Box 1020 Oak Ridge, TN 37831-1020 Ph: 423-576-2606 / Fx: 423-576-2865 ESTSC@ADONIS.OSTI.GOV www.doe.gov/html/osti
FTI/DOE (see FTI listing under PC Versions of DOE-2, below)			

PC Versions of DOE-2

Input Output	Support	Program Price	Vendor Information
No information given No information given	None	$395 + $15/SH including one set weather data (your choice) and documentation	**ADM-DOE- 2 (Richard Burkhart)** ADM Associates adm_asc@ns.net 3239 Ramos Circle Sacramento, CA 95827-2501 Ph: 916-363-8383 / Fx: 916-363-1788
Customizable windows GUI dynamically built based on DOE-2 macros. Tables and graphs exportable to MS Excel 97. Custom reports dynamically generated in Word 97.	Support price is negotiable; online help included with the program.	$500 consultant $2000 client Documentation available	**Compare-IT (Ed Erickson)** RLW Analytics, Inc. 1055 Broadway, Suite G Sonoma, CA 95476 Ph: 707-939-8823 / Fx: 707-939-9218 Info@rlw.com or www.rlw.com
Interactive, graphical, fill-in-the-blanks Customizable tables and graphics	Unlimited, except for DOE-2 modeling advice. On-line help.	$895 with DOE-2 and doc $495 without DOE-2 Source code not available.	**DOE-Plus (Steve Byrne)** Item Systems 321 High School Road NE #344 Bainbridge Island, WA 98110 Ph: 206-855-9540 / Fx: 206-855-9541 byrne @ item.com
Graphical Graphs, forms	Unlimited support	DOE-2 Module: Non-residential $ 700[1,2] Residential $ 250[1,2] Program Interface $ 195[3] [1] price reflects cash discount [2] includes documentation [3] required	**EnergyPro (Demian Vonderkulen)** Gabel Dodd/EnergySoft LLC 100 Galli Drive #1 Novato, CA 94949-5657 Ph: 415-883-5900 / Fx: 415-883-5970 demian@energysoft.com
Fill-in-the-blanks Standard DOE reports plus some custom graphic reports	Unlimited phone support	$1295 w/documentation Source code not available.	**EZDOE (Bill Smith)** Elite Software P.O. Box 1194 Bryan, TX 77806 Ph: 409-846-2340 / Fx: 409-846-4367 bsmith @ elitesoft.com
Version 2.x: text based Version 3.x: graphical All standard DOE-2 reports Run time and status graphics	Free support for 90 days from date of purchase. After 90 days, support is: $35 email per incident $55 hour per incident $125 per hour for engineering advice. Bugs reports free.	$ 995.99 US w/documentation $1066 Int'l w/documentation $4999.99 source code	**FTI/DOE2 (Scott A. Henderson)** Finite Technologies Inc. 3763 Image Drive Anchorage, Alaska 99504 Ph: 907-333-8937 / Fx: 907-333-4482 info @ finite-tech.com
Standard text-based	Unlimited support.	$ 495 w/documentation Source code not available.	**PRC-DOE-2 (Paul Reeves)** Partnership for Resource Conservation 140 South 34th Street Boulder, CO 80303 Ph: 303-499-8611 / Fx: 303-554-1370 Paul.Reeves@DOE2.com
Graphical Graphical	90 days free phone and email support. Support is $195 per year after first 90 days	Version 2.6 is $495 w/documentation Call for Version 3.0 pricing Source code not available.	**VisualDOE 3.0 (C. Eley or Erik Kolderup)** Charles Eley Associates 142 Minna Street San Francisco, CA 94105 Ph: 415-957-1977 / Fx: 415-957-1381 support@eley.com

Continued on next page

DOE-2 Help Desk: Bruce Birdsall
Call or fax Bruce Birdsall if you have a DOE-2 problem or question. If you need to fax Bruce, please be sure to phone him first. This is a **free** service provided by the Simulation Research Group at Lawrence Berkeley National Laboratory.

Bruce Birdsall
Phone/Fax: (925) 671-6942
M-F 10 a.m. to 3 p.m. PDT

DOE-2 Directory of Program Related Software and Services (continued)

Pre- and Post-Processors for DOE-2

Program Name	Description
DrawBDL	**DrawBDL,** Version 2.02, is a graphic debugging and drawing tool for DOE-2 building geometry. DrawBDL reads your BDL input and makes a rotate-able 3-D drawing of your building with walls, windows, and building shades shown in different colors for easy identification. *[See User News, Vol. 14, No. 1, p. 5-7, Vol. 14, No. 4, p. 16-17, and Vol. 16, No. 1, p.37]*
Visualize-IT (Visual Data Analysis Tools)	The ***Energy Information Tool*** is used to review and understand metered or DOE-2.1E hourly output data. It provides the ability to see all 8760 (or 35040) data points for a year's worth of data. Use *Energy/Print* to get an overview of the data and then apply a variety of tools (load shapes, load duration curves, etc.). The ***Calibration Tool*** compares DOE-2.1E hourly output data to total load and/or end-use metered data. Options include monthly demand and load 2D graphs, maximum and seasonal load shapes, average load profiles, end use residuals, monthly average week and weekend days, and dynamic comparison load shapes. Both programs requires a 486 or higher computer and SVGA graphics capabilities. *[See User News Vol. 17, No. 2, p. 2-6]*
PRC-TOOLS: **PRC-Grab** **PRC-Hour** **PRC-Peak**	***PRC-Tools*** aid in extracting, analyzing, and formatting DOE-2 output. ***PRC-Grab*** automates the process of extracting any number of answers from DOE-2 standard output files. ***PRC-Hour*** and ***PRC-Peak*** format the hourly output and create Peak-Day and Average-Day load shapes for any number of periods and for any combination of hourly values.

Special Versions of DOE-2

Program Name	Description
DesiCalc No demo	DesiCalc, from the Gas Research Institute, screens desiccant cooling applications. It estimates annual or monthly energy loads, using hour-by-hour simulations, and costs for 11 typical commercial buildings in 236 geographical locations in the United States. The tool uses electrical equipment from a library of five typical systems and compares the performance of any of the systems with an alternative configuration, the chosen electric system supplemented with a desiccant dehumidifier. Includes the latest TMY2 meteorological database
Energy Gauge USA **(Residential DOE-2)**	*Energy Gauge USA* allows the simple calculation and rating of residential building energy use in the United States. The simulation calculates a six-zone model of the residence (conditioned zone, attic, crawlspace, basement, garage and sunspace) with the various buffered spaces linked to the interior as appropriate. TMY weather data for the program are available for 213 locations around the U.S.
Home Energy Saver **(Residential DOE-2)** Free, interactive, Web-based program	The *Home Energy Saver* (HES) is designed to help consumers identify the best ways to save energy in their homes, and find the resources to make the savings happen. The HES calculates heating and cooling consumption using DOE-2.1E. The program performs a full annual simulation for a typical weather year (involving 8760 hourly calculations) from 239 locations around the United States in about 10-20 seconds.
Perform-95	Created for the State of California Energy Commission's, Title 24 energy code. Perform-95 is an interface shell with DOE-2 as the engine. Standard text-based input. Output is only California Title 24 compliant. Technical support available for $100/year from Gabel-Dodd Energy Soft LLC, 100 Galli Drive #1, Novato, CA 94960. Call 415-883-5900 for details.
RESFEN-3.1 No demo	RESFEN calculates the energy and cost implications of a building's windows compared to insulated walls. The relative energy and cost impacts of two different windows can also be compared against each other. RESFEN calculates the heating and cooling energy use and associated costs as well as the peak heating and cooling demand for specific window products. Users define a problem by specifying the house type (single story or two story), geographic location, orientation, electricity and gas cost, and building configuration details (such as wall type, floor type, and HVAC systems). Window options are defined by specifying the window's size, shading, and thermal properties: U-factor, Solar Heat Gain Coefficient, and air leakage rate.

DOE-2.1E Bug Fixes via FTP

If you have Internet access you can obtain the latest bug fixes to the LBNL version of DOE-2.1E by anonymous ftp. Here's how…

ftp to either gundog@lbl.gov or to 128.3.254.10
login: *type* anonymous
password: *type in your e-mail address*

After logging on, go to directory pub/21e-mods ; bug fixes are in files that end with **.mod** . A description of the fixes is in file **VERSIONS.txt** in directory **pub** . Each fix has its own version number, ***nnn*** , which is printed out as DOE-2.1E- *nnn* on the DOE-2.1E banner page and output reports when the program is recompiled with the fix. You may direct questions about accessing or incorporating the bug fixes to Ender Erdem (aeerdem@lbl.gov).

¨ Subscriptions To *Building Energy Simulation User News* ¨

The *User News* is a quarterly newsletter, sent free of charge, to users of EnergyPlus, DOE-2, BLAST, SPARK, GenOpt and their derivatives. The newsletter is also available in PDF format at http://gundog.lbl.gov > Publications > User News.

To receive the newsletter or to obtain back issues, please contact: Kathy Ellington (KLEllington@lbl.gov), Simulation Research Group MS: 90-3147, Lawrence Berkeley National Laboratory, Berkeley, CA 94720. Fax: (510) 486-4089

Newsletter Deadline

The Fall 1999 issue of the *User News* will be sent to the printer on September 3; please submit any information well in advance.

DOE-2 Directory of Program Related Software and Services

Pre- and Post-Processors for DOE-2

Operating System	Version of DOE-2	Price	Vendor
Windows 3.1, 95, NT	DOE-2.1E	$125.00 plus shipping	**Joe Huang & Associates** 6720 Potrero Avenue El Cerrito, CA 91364 Ph/Fx: 510-236-9238
Windows 3.1	DOE-2.1E		**RLW Analytics, Inc.** **(Ed Erickson)** 1055 Broadway, G Sonoma, CA 95476 Ph: 707-939-8823 Fx: 707-939-9218 Info@rlw.com / www.rlw.com
Windows 95, NT	DOE-2.1E	$99.00	**Partnership for Resource Conservation** 140 South 34th Street **(Paul Reeves)** Boulder, CO 80303 Ph: 303-499-8611 / Fx: 303-554-1370 Paul.Reeves@DOE2.com

Special Versions of DOE-2

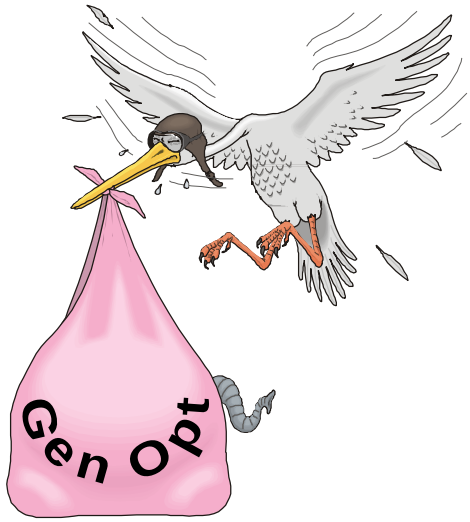
Operating System	Based on this version of DOE-2	Price	Vendor
Windows 3.1, 95, 98, NT	DesiCalc is an overlay of DOE-2.1E and contains the complete DOE-2.1E program. It also contains the complete TMY2 data set.	$295 including documentation +8.75% tax in IL +4.5% tax in VA S/H $20	**DesiCalc GRI-98/0127** **(Doug Kosar)** Order from: GRI Fulfillment Center Ph: 773-399-5414 Fx: 630-406-5995
Windows 95, 98, NT	DOE-2.1E	Contact Danny Parker at FSEC for availability.	**Energy Gauge USA** **(Danny Parker)** Florida Solar Energy Center 1679 Clearlake Road Cocoa, FL 32922 Ph: 407-638-1405 /Fx: 407-638-1439
Web-based	DOE-2.1E	free	**Home Energy Saver** interactive program at http://eande.lbl.gov/CBS/VH
DOS	DOE-2.1E	$250 including Perform-95 manual. Order #P440-96-0006	**California Energy Commission** Publications MS-13 P.O. Box 944295 Sacramento, CA 94244-2950 Ph: 916-654-5106
	DOE-2.1E	free	**RESFEN 3.1** Fax: (510) 486-4089 or mail your request to: Windows & Daylighting Group MS 90-3111 Lawrence Berkeley National Laboratory Berkeley, CA 94720

GenOpt: A Generic Optimization Program

Release of Version 1.0

GenOpt 1.0, a multi-parameter optimization program, has been released. It is designed to minimize an *objective function*, such as annual energy use, that is calculated by an external simulation program such as DOE-2, BLAST, TRACE, SPARK, TRNSYS, etc. GenOpt determines the values of the system parameters that lead to optimal operation. It can also identify unknown parameters in a data-fitting process. GenOpt can be used with any simulation program that has text-based input and output. It also offers an interface for adding custom optimization algorithms to its library.

The Genopt 1.0 program and user's manual may be downloaded free of charge from http://gundog.lbl.gov > GenOpt.



Help Wanted!

QUANTUM CONSULTING INC

ENGINEER
Job Code HREWQ

We are currently seeking a talented, motivated engineer to join our team. The ideal candidate will have a strong background in consulting within the energy industry, a minimum of 2 years experience and a degree in engineering or a related field. Must have knowledge of HVAC systems; DOE-2 experience is a plus. Excellent written and oral communication skills are required. We offer a competitive salary/benefit package and outstanding growth potential in a casual and social work environment. Please submit cover letter and resume and salary requirements.

Fax resume to (510) 540-7268 or mail
Attn: HRDOE2
Quantum Consulting, Inc.
2030 Addison Street, #410
Berkeley, CA 94704
email: HR@qcworld.com

Steven Winter Associates

ENERGY ANALYSIS

Three positions on high visibility design and research projects:

Engineer or Architect with minimum one year experience using DOE-2, BLAST or TRNSYS. Project Manager with writing ability and over 5 years experience in detailed DOE-2 simulations. HVAC Engineer with minimum 5 years experience.
Excellent opportunities for advancement and long-term career. Positions are for the Norwalk, CT, office, near New York City and New Haven.

Send resume in confidence to:
Adrian Tuluca, Principal
Steven Winter Associates, Inc.
50 Washington Street
Norwalk, CT 06854
Fax: (203) 852-0741
email: jobs@swinter.com

RLW ANALYTICS

PROJECT MECHANICAL ENGINEER
Seeking ME with experience in HVAC and other facility mechanical systems. Candidate will provide support to building simulation models in DOE-2.1E for the estimation of energy savings estimates for retrofit motor, HVAC, process and lighting installations. Other responsibilities will include technical writing, research, and travel.
Respondents must be able to deliver quality, result-oriented projects in budget and on-time, and be able to maintain good client relationships. Computer skills must include expertise in DOE-2.1E building simulation modeling, Win95 and Microsoft Office Suite (Excel, Word, Access, PowerPoint). Successful candidate will be bright, energetic, and team-oriented. Additional information on RLW can be found at www.rlw.com. EOE.

Resumes:
Matt Brost
RLW Analytics, Inc.,
1055 Broadway Suite G
Sonoma, CA 95476
Fax: (707) 939-9218.
email: mattb@rlw.com

RLW ANALYTICS

PROJECT MANAGER
We are seeking a full time Project Manager to add to our team of consultants. Candidate must have strong communication and presentation skills in client and conference settings. Respondents must be able to deliver quality, result-oriented projects in budget and on-time, and be able to maintain good client relationships. The ideal candidate will have a strong background in market research and expertise in one or more of the following: statistics, economics, data analysis, and technical writing skills for report and proposal writing. Computer skills must include Win95 and Microsoft Office Suite (Excel, Word, Access, PowerPoint). Successful candidate will be bright, energetic, and team-oriented.

Resumes:
Tom Ledyard
RLW Analytics, Inc.
179 Main Street
Middletown, CT 06457
Fax: *860) 346-5533
email: Tledyard@rlw.com

RLW ANALYTICS

ENTRY LEVEL ENGINEER
RLW Analytics, Inc. seeks to hire a full time entry level engineer with fundamental HVAC system, motors and VSD knowledge with a general knowledge of electrical energy use and consumption. This position will work under a Senior Engineer, and applicants are expected to bring to the position the skills and ability to learn on the job and provide analysis support. The successful candidate must have strong Excel and Word abilities. Mechanical Engineer graduate preferred. Responsibilities will include significant interface with utility customers, field data collection, analysis to assess building and retrofit measure performance, and reporting.

Meetings, Conferences, Symposia

12th Symposium on Improving Building Systems in Hot and Humid Climates	**ASHRAE Winter Meeting**
To be held May 14-17, 2000 in San Antonio, TX	To be held February 5-9, 2000 in Dallas, TX
Contact: drosen@esl.tamu.edu Dawna Rosenkranz (Room 053 WERC) Energy System Laboratory Texas A&M University College Station, Texas 77843-3581	Contact: jyoung@ashrae.org -- www.ashrae.org ASHRAE Meetings Section 1791 Tullie Circle NE Atlanta, GA 30329
Tel: 409.847.8950 -- Fax: 409.847.8687	Tel: 404.636.8400 -- Fax: 404.321.5478

New Book: "*Case Studies of Low Energy Cooling Technologies"*

A new publication, "*Case Studies of Low Energy Cooling Technologies*," is now available. The book was produced by International Energy Agency Annex 28, edited by Mark Zimmerman and Johnny Andersson. This attractive 150 page soft-bound book contains numerous color and monochrome photographs, drawings, charts, and text explaining the design concept, engineering detail and measured performance of 18 case study buildings in the member nations that utilize low-energy cooling techniques.

Please send me _____ copies of Annex 28 Publication *"Case Studies of Low Energy Cooling Technologies"* for the price of $117/USD each*

Name: _____

Company: _____ Fax: _____

Address: _____ Email: _____

City: _____ Country: _____

Signature: _____ Date: _____

Please send order form to
Mark Zimmermann
EMPA
CH 8600
Duebendorf, Switzerland

Fax: +411 823 40 09
email: mark.zimmermann@empa.ch

INTERNATIONAL DOE-2 RESOURCE CENTERS

The people listed here have agreed to be primary contacts for DOE-2 program users in their respective countries. Each resource center has the latest program documentation, all back issues of the User News, and recent LBNL reports pertaining to DOE-2. These resource centers will receive copies of all new reports and documentation. Program users may make arrangements to photocopy the new material for a nominal cost. We hope to establish resource centers in other countries; please contact us if you are interested in establishing a center in your area.

Australasia
Dr. Deo K. Prasad/P. C. Thomas, SOLARCH, University of New South Wales, P.O. Box 1, Kensington, N.S.W. 2033, Australia
email PC.Thomas@unsw.EDU.AU / Tel: (61)-2-9311-7136 (P.C. Thomas) / Fax: (61) 2-9662-1378

Australia
Murray Mason, ACADS BSG, 16 High Street, Glen Iris VIC. 3146, Australia / Tel: (61) 885 6586 / Fax: 885 5974

Egypt
Dr. Ossama A. Abdou, Center for Building Environmental Studies and Testing (C-Best), 15-El-Shibani Street, Almanza, Cairo, Egypt
oabdou@hotmail.com / Tel: (20-2) 391-1137 or 417-4583 / Fax: 519-4343

Germany
B. Barath or G. Morgenstern, Ingenieurbüro Barath & Wagner GmnH, Postfach 20 21 41, D-41552 Kaarst, Germany Tel: (0049) 2131 75 74 90 12
G. Morgenstern / Fax: (0049) 2131 75 74 90 29

Hong Kong, China, Taiwan, Japan
Dr. Sam C. M. HUI or K.P. Cheung, Dept of Architecture, University of Hong Kong, Pokfulam Road, Hong Kong (SAR), CHINA / cmhui@hku.hk or kpcheuna@hku.hk / http://arch.hku.hk/research/BEER/DOE-2/DOE-2.htm Tel: (852) 2859-2123 (direct to Sam Hui) / Fax: (852) 2559-6484

India
Jiten Prajapati or Anil K. Anand, Energy Systems Engineering, IIT-Mumbai, Powai, Mumbai 400 076, INDIA Tel : 91-022-578 2545 x7378

Korea (Chungnam)
Dr. Jun Tae Kim, Department of Architectural Engineering, Kongju National Univ., 182 Sinkwan-dong, Kongju, Chungnam, 314-701, Republic of Korea / jtkim@knu.kongju.ac.kr / Tel: (82) 416 850 8653 / Fax (82) 416 856 9388

Korea (Taejon)
Dr. Euy-Joon Lee and Jong-Ho Yoon, Passive Solar Research Team, Bldg 2 / Rm 202, Korea Institute of Energy Research, Daeduk Science Town, 71-2 Jang-Dong, Yusong-Gu, Taejon 305-343, Republic of Korea, Lee: ejlee@kier.re.kr, Yoon: yesru@kier.re.kr / Tel: (82) 42 860 3514 / Fax: (82) 42 860 3132

New Zealand
Tan Yune, Architecture Department, The University of Auckland, Private Bag 92019, Auckland, New Zealand tanyune@ccu1.auckland.ac.nz / Tel: 64-9-373-7999 x5647 / Fax: 64-9-373-7410

Portugal, Spain, Italy, and Greece
Antonio Rego Teixeira, ITIME, Unidade de Energia, Estrada do Paco do Lumiar, 1699 Lisboa, Portugal
art@itime.ineti.pt / Tel: (351) 1-350-29 31 / Fax: (351) 1-716-43 05

Singapore, Malaysia, Indonesia, Thailand, and the Philippines
WONG Yew Wah, Raymond, Nanyang Technological University, School of Mechanical and Production Engineering, Nanyang Avenue, Singapore 2263, Republic of Singapore, mywwong@ntu.edu.sg / Tel: (65) 790-5543 / Fax: (65) 791-1859

South Africa
Prof. L. J. Grobler, School of Mechanical and Materials Engineering, University of Potchefstroom, Private Bag X6001, Potchefstroom 2520, South Africa, mgiljg@puknet.puk.ac.za / Tel: (27 148) 299 1328 / Fax: (27 148) 299 1320

South America
Prof. Roberto Lamberts,Universidade Federal de Santa Catarina, Campus Universitario-Trindade, Cx. Postal 476, 88049-900 Florianopolis SC, BRASIL lamberts@ecv.ufsc.br / Tel: + 55 48 3319272/ Fax: + 55 48 3319770

Switzerland
René Meldem, Meldem Energie SA, 30 a ch. de la Fauvette, CH-1000 Lausanne 12, Switzerland
meldem.energie@bluewin.ch / Tel: +41 21 653-8044 / Fax: +41 21 653-8054

INTERNATIONAL DOE-2 ENERGY CONSULTANTS

Australia
P. C. Thomas, Sustainable Building & Energy Consultants, 6/52 Houston Road, Kingsford NSW 2032, Australia. Tel/Fax: (61) 2 9662 0205, Mobile (61) 417 405 478, pc_thomas@iname.com

Belgium
Andre Dewint, Andre DEWINT, s.a. Alpha Pi n.v., Av Winston Churchill,232/7, B-1180 Bruxelles, BELGIUM, Tel: (02) 34 34 251 / Fax: (02) 343 03 77

Canada
Curt Hepting, P.Eng. EnerSys Analytics, 2989 Delahaye Drive, Coquitlam, B.C. V3B 6Y9 Canada enersys@infoserve.net / www.enersys.bc.ca/homepage / Tel: (604) 552-0700 / Fax (604) 552-0713

Dejan Radoicic, D. W. Thomson Consultants, Ltd., 1985 West Broadway, Vancouver, BC V6J 4Y3, Canada

Neil A. Caldwell, PE, DukeSolutions Canada, Inc., 1730 - 401 West Georgia St., Vancouver, BC V6B 5A1 Canada ncaldwe@duke-energy.com

Stephane Bilodeau, PE, Groupe Enerstat, Inc., 79 Wellington N. #202, Sherbrooke (Quebec) J1H 5A9, Canada bill@aramis.gme.usherb.ca / Tel: (819) 562-8040 / Fax (819) 562-5578

Gordon Shymko, G.F. Shymko & Associates, Inc., G. F. Shymko & Associates Inc., 129 Evergreen Crescent S.W., Calgary, Alberta T2Y 3R2, Canada

Germany
Jens Grundt and Ludwig Michel, GMW-Ingenieurburo, Vahrenwalder Str. 7, D-30165 Hannover, Germany GMW-Ing.buero@t-online.de / Tel: 0049-511 9357440/Fax 0049-511-935744

New Zealand
Paul Bannister Energy Group, Ltd., 14a Wickliffe Street (P.O. Box 738), Dunedin New Zealand eglstaff@earthlight.co.nz

Switzerland
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meldem.energie@bluewin.ch / Tel: +41 21 653-8044 / Fax: +41 21 653-8054

Philip Schluchter, Institut fur Bauphysik Klein, Urs Graf-Strasse 1, CH4052 Basel, Switzerland

Gerhard Zweifel, Zentralschweizerisches Technikum Luzern (ZTL), Abt. HLK, CH-6048 Horw, Switzerland gzweifel@ztl.ch

Markus Koschenz, Building Equipment Section 175, EMPA, 129 Überlandstrasse, CH-8600 Dübendorf, Switzerland

U. S. DOE-2 ENERGY CONSULTANTS

Arizona				
Marlin S. Addison	M. S. Addison & Associates	1215 West 12th Place	Tempe, AZ 85281	(602) 968-2040
Chuck Sherman	Energy Simulation Specialists	64 East Broadway, #230	Tempe, AZ 85282	(602) 784-4500
Sarat Kanaka	EcoGroup, Inc., Suite 301	2085 E. Technology Circle	Tempe, AZ 85284	(602) 777-3000
California				
M. Gabel, R. Howley	Gabel Associates, LLC	1818 Harmon Street	Berkeley, CA 94703	(510) 428-0803
George Marton	1129 Keith Avenue		Berkeley, CA 94708	(510) 841-8083
Jeff Hirsch	James J. Hirsch Associates	12185 Presilla Road	Camarillo, CA 93012	(805) 532-1045
John R. Aulbach, PE	23508 Naffa Avenue		Carson, CA 90745	(310) 549-7118
Leo Rainer	Davis Energy Group, Inc.	123 C Street	Davis, CA 95616	(916) 753-1100
L. Heshong, D. Mahone	The Heshong Mahone Group	11626 Fair Oaks Blvd, #302	Fair Oaks, CA 95628	(916) 962-7001
Cliff Gustafson	Taylor Systems Engrg. Inc.	9801 Fair Oaks Blvd., #100	Fair Oaks, CA 95628	(916) 961-3400
Steven D. Gates, PE	11608 Sandy Bar Court		Gold River, CA 95670	(916) 638-7540
Tom Lunneberg, PE	Constructive Tech. Group	16 Technology Dr., #109	Irvine, CA 92618	(714) 790-0010
David J. Schwed	Romero Management Assoc	1805 West Avenue K	Lancaster, CA 93534	(805) 940-0540
Robert E. Gibeault	A-TEC	5515 River Avenue, # 301	Newport Beach, CA 92663	(714) 548-6836
Martyn C. Dodd	Gabel Dodd/EnergySoft, LLC	100 Galli Drive, # 1	Novato, CA 94949	(415) 883-5900
Robert Mowris, PE	Robert Mowris & Associates	10 Ridge Lane	Orinda, CA 94563	(925) 254-9770
Patrick Nkwocha, PE	Global Tech Services	3360 Foothill Blvd., #108	Pasadena, CA 91107	(626) 583-8205
James Trowbridge, PE	Trowbridge Engineering	8240 Caribbean Way	Sacramento, CA 95826	(916) 381-4753
Greg Cunningham	EnerSys Solutions LLC	114 Sansome St., #1201	San Francisco, CA 94104	(415) 296-9760
Charles Eley, T. Tathagat	Eley Associates	142 Minna Street	San Francisco, CA 94105	(415) 957-1977
John F. Kennedy, PE	GeoPraxis, Inc.	18850 Robinson Road	Sonoma, CA 95476	(707) 996-9408
Chandra Shinde, PE	ENVIRODESIGN GROUP	385 S. Lemon Ave., E-266	Walnut, CA 91789	(909) 598-1980
Colorado				
Fred Porter	Architectural Energy Corp	2540 Frontier Ave, #201	Boulder, CO 80301	(303) 444-4149
Paul Reeves	PRC	140 South 34th Street	Boulder, CO 80303	(303) 499-8611
Ellen Franconi	P.O. Box 1284		Boulder, CO 80306	(303) 786-7319
Charles Fountain	Burns & McDonnell	8055 E. Tufts Avenue, #330	Denver, CO 80230	(303) 721-9292
Susan Reilly	Enermodal Engineering	1554 Emerson Street	Denver, CO 80218	(303) 861-2070
Joel Neymark, PE	2140 Ellis Street		Golden, CO 80401	(303) 384-3672
Norm Weaver, PE	Interweaver Consulting	P.O. Box 775444	Steamboat Spgs, CO 80477	(970) 870-1710
Connecticut				
Adrian Tuluca	Steven Winter Associates	50 Washington Street	Norwalk, CT 06854	(203) 852-0110
District of Columbia				
Kurmit Rockwell, PE	XENERGY, Inc., Suite 1110	1025 Connecticut Ave., N.W.	Washington, DC 20036	(202) 872-1626
Florida				
Philip Wemhoff	1512 South McDuff Avenue		Jacksonville, FL 32205	(904) 632-7393
Dr. Paul Hutchins PE,CEM	Reynolds Smith & Hills, Inc.	4651 Salisbury Road	Jacksonville, FL 32256	(904) 279-2277
Georgia				
Lung-Sing Wong, PE	Building Performance Engrs.	1351 Oakbrook Dr., #100	Norcross, GA 30093	(770) 409-0400
Illinois				
Gary H. Michaels, PE	G.H. Michaels Associates	1512 Crain Street	Evanston, IL 60202	(847) 869-5859
Prem N. Mehrotra	General Energy Corp.	230 Madison Street	Oak Park, IL 60302	(708) 386-6000
Robert Henninger, PE	GARD Analytics, Inc.	1028 Busse Highway	Park Ridge, IL 60068-1802	(847) 698-5686
Kansas				
Dr. Brian A. Rock, PE	A/E Dept, Marvin Hall	University of Kansas	Lawrence, KS 66045-2222	(785) 864-3603
Massachusetts				
Michael Andelman	JRMA & Associates	421 Watertown St.	Boston, MA 02210	(617) 964-8889
C. Kalasinsky PE, T.Chan	R.G. Vanderweil Engrs., Inc.	274 Summer Street	Newton, MA 02458-1113	(617) 423-7423
Mark Mullins	HEC Energy & Design Services	24 Prime Parkway	Natick, MA 01760	(508) 653-0456
Missouri				
Mike Roberts	Roberts Engineering Co.	11946 Pennsylvania	Kansas City, MO 64145	(816) 942-8121
Bruce A. Leavitt, PE	Wm. Tao & Associates Inc.	2357-59th Street	St. Louis, MO 63110	(314) 644-1400
Montana				
Michael W Harrison, PE	Harrison Engineering	139 Bluebird Lane	Whitehall, Montana 59759	(406) 287-5370
Nebraska				
Philip M. Schreier, PE	Farris Engineering	11239 Chicago Circle	Omaha, NE 68154-2634	(402) 330-5900
New York				
J. Fireovid, K. Yousef	SAIC Energy Solutions Div.	1 Marcus Boulevard	Albany, NY 12205	(518) 458-2249
H. Henderson, S. Carlson	CDH Energy Corporation	P.O. Box 641	Cazenovia, NY 13035	(315)-655-1063
Dave Pruitt, Scott Frank	Jaros, Baum & Bolles	80 Pine Street	New York, NY	(212) 530-9300
North Carolina				
Hank Jackson, PE	P.O. Box 675		Weaverville, NC 28787-0675	(828) 658-0474
Gopal Shiddapur, PE	DukeSolutions (MC: ST05A)	230 S. Tryon Street, # 400	Charlotte, NC 28202	(704) 373-4439
Oregon				
J. Karasaki, PE, R. Ogle PE	CBG Consulting Engineers	6650 SW Redwood Ln, #355	Portland, OR 97224	(503) 620-3232
Texas				
Jeff S. Haberl	Energy Systems Laboratory	Texas A&M University	College Stn., TX 77843-3123	(409) 845-6065
Virginia				
Dave Walker	Walker Engineering	P.O. Box 366	Staffordsville, VA 24167	(540) 921-4544
Washington				
Steve Byrne	ITEM Systems, suite 344	321 High School Road NE	Bainbridge Island, WA 98110	(206) 855-9540
Gregory J. Banken, PE.	Q-Metrics, Inc.	P.O. Box 3016	Woodinville, WA 98072-3016	(425) 825-0200

Training: DOE-2 courses for beginning and advanced users. Contact Marlin Addison Phone: (602) 968-2040, marlin.addison@doe2.com

Software from Lawrence Berkeley National Laboratory

Downloads	Download Site (http://)
BDA (Building Design Advisor) (for building decision-makers)	kmp.lbl.gov/bda
COMIS (multizone air flow and contaminant transport model)	www-epb.lbl.gov/comis
GenOpt (generic optimization program)	gundog.lbl.gov > GenOpt
RADIANCE (analysis and visualization of lighting in design) ***Desktop Radiance*** (integrates the Radiance Synthetic Imaging System with AudoCAD Release 14)	radsite.lbl.gov/radiance/license.html kmp.lbl.gov/dt-rad
RESEM (Retrofit Energy Savings Estimation Model) (calculates long-term energy savings directly from actual utility data)	eetd.lbl.gov/btp/resem.htm
SPARK (Simulation Problem Analysis and Research Kernel) (build simulations of innovative building envelope and HVAC systems by connecting component models)	gundog.lbl.gov > SPARK ***WinSPARK*** - for Windows ***VisualSPARK*** - for Windows or UNIX
SUPERLITE (calculate illuminance distribution for room geometries)	eetd.lbl.gov/btp/superlite20.html
THERM (model two-dimensional heat-transfer effects in building components where thermal bridges are of concern)	windows.lbl.gov/software/therm/therm.html
WINDOW 4.1 (thermal analysis of window products)	windows.lbl.gov/software/window/window.html

Request by Fax from 510.486.4089	
RESFEN 3.1 (choose the most energy-efficient and cost-effective window for a given residential application)	windows.lbl.gov/software/resfen/resfen.html

Web Based	
Home Energy Saver (quickly compute a home's energy use)	hes.lbl.gov

Purchase	
ADELINE 2.0 (daylighting/lighting performance in complex spaces)	radsite.lbl.gov/adeline/HOME.html

LAWRENCE BERKELEY NATIONAL LABORATORY
Simulation Research Group MS: 90-3147
University of California
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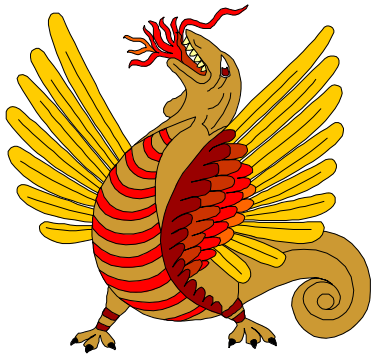

Run for safety, foolish pedestrians!